Chapter 7

Biosolids-Derived By-Products and Other Organic Materials

Introduction

The management practices recommended in this biosolids field storage guidance document are also generally applicable to storage of other types of non-hazardous organic residuals that are suitable for recycling and beneficial use as a fertilizer or soil conditioner. These materials may be used for agricultural, horticultural, reclamation, landscaping or landfill cover purposes. Storage is frequently desirable for these products due to seasonal markets for some materials (e.g., compost or topsoil), crop cycles, and weather restraints on land application programs. Organic residuals may be generated through industrial or agricultural processes and include biosolids-derived products that serve as topsoil. Examples of these materials are provided below. A more extensive list of organic materials is provided in Appendix E.

Other Organic By-Products

Biosolids blended topsoil
Yardwaste (leaves, grass clippings, woodchips)
Food processing residuals (fruit and vegetable peelings, pulp, pits)
Meat, seafood, poultry and dairy processing wastewater and solids
Hatchery wastes
Animal manure and bedding
Waste grain, silage
Spent mushroom substrate
Wood ash
Pharmaceutical and brewery waste
Pulp and paper mill residues
Mixed refuse (food scraps, paper etc.)
Textile residuals

Storage Considerations

Some organic residuals are unmodified (e.g., vegetable peelings, wood ash, etc.), others are generated through wastewater treatment processes (slaughterhouse wastes), or undergo composting, blending, or other treatment methods. The physical consistency of these residual materials, may be either liquid, semi-solid/dewatered, or dry.

As with biosolids, locating suitable sites, and the development and implementation of practices to deal with storage and handling of these materials will benefit from considering the Critical Control Points approach described in Chapter 1 to address odors, water quality, pathogens, field management practices and community relations. Depending on the material in question, some of these issues may be more significant than others. To determine which combination of management practices, handling techniques, and storage options is most suitable, the following specific product characteristics should be evaluated:

Physical consistency and water content

Biological Stability
Pathogen Potential
Odor Characteristics
Vector Attraction
Nutrient and BOD Content
Fats and Oils
Dust Potential
Combustibility
Consistency and predictability of product

Physical consistency and water content

The physical consistency and solids content of the material, whether liquid, semisolid, or dewatered or dried, is essential for evaluating the suitability of the material for various types of storage options and is essential for planning storage capacities. Generally, materials with solids contents less than 12 percent are not appropriate for field stockpiles because the material is too wet to hold shape and will slump and flow. Storage of these materials is best accomplished in lagoons, tanks, or basins. However, dried, composted, dewatered materials may be suitable for either field stockpiles or constructed storage facilities.

The percent solids in liquid and semisolid materials may change over time due to precipitation or evaporative losses. Solids may also settle during storage. Depending on the degree of liquid/solids separation and the amount of recirculation possible to resuspend solids prior to removal, it may be necessary to retest nitrogen and percent solids to determine appropriate application rates.

Biological Stability

Some organic residuals contain organic constituents that are easily digestible (decomposable) by microorganisms and others do not. Materials not biologically stabilized through composting or other treatments (Table 2.1), will require a higher level of management during storage to prevent the development of unacceptable odors or attraction of flies or other nuisance vectors. Other organic residuals, that are not easily digestible, present minimal potential for the generation of nuisance odors. In some cases, storage also allows blended ingredients to react further with each other (as in curing or aging phase with compost) and this produces a more stable material with less odor potential when it is ultimately land applied.

Consideration of the biological stability of the material to be stored is a key factor in siting decisions (such as suitable buffers) and in selection of appropriate storage methods and management practices. Explaining how the operations methods and practices are suited to deal with the type of biosolids and its degrees of biological stability is an additional and important way to gain community acceptance.

Pathogen Potential

Certain organic residuals (such as poultry processing wastes or animal manures) may contain pathogens at levels similar to or higher than the limits established for Class B biosolids. These materials can have a potentially negative impact on human or animal health if they are not properly managed.

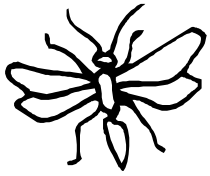
In some instances, these materials may be disinfected or stabilized prior to storage, or the storage period itself can provide time for pathogen die off. If the material is a biosolids blend that must meet Class A standards, testing for pathogens as per the Part 503 regulations testing will be necessary.

Odor Characteristics

Offensive odors in most organic residuals are generated during microbial decomposition of the organic matter constituents. In some instances, a material contains residual levels of compounds that are inherently odorous but do not result from biological decomposition. The potential for release of unacceptable levels of odorous compounds is most likely when materials are agitated, mixed, or moved. Stabilization processes (Table 2.1) used to control pathogens generally also help reduce potential odor levels. Other methods or management practices for odor management include: moisture reduction, maintenance of aerobic conditions, pH adjustment, enclosed handling and storage, cold weather storage, minimization of storage duration during hot humid weather, and keeping dried materials dry in the field. A useful technique to reduce odor from stored materials is to cover them with compost or sawdust. Field storage of highly odorous materials may require either remote sites or

enclosed handling systems (e.g. tanks and subsurface injection applicators). Depending on the stability of the product and storage conditions, the potential for off-site odor may increase the longer (months or more) the material is stored and the greater the volume of stored material.

Vector Attraction



Organic residuals such as food processing wastes and animal manures, or other unstabilized materials may be attractive to flies or vermin, which can create nuisance conditions or, with certain materials, are a potential pathway for pathogen transmission. To foster community acceptance, materials must be managed in a manner that controls vectors and prevents off-site nuisances.

Nutrient and BOD Content

The nitrogen content and its form in organic residuals depends on the type of material, handling and storage methods, and the length of storage. Materials with high ammonia levels can easily lose this nutrient through volatilization. Appropriate handling and storage options can reduce odor potential and conserve this plant nutrient.

High biological oxygen demand (BOD) reflects the readily degradable organic matter in the material. Many untreated organic residuals, particularly those containing oils and greases, have a high BOD. This means that the material is subject to microbial decomposition and possibly to anaerobic conditions that may generate odors during storage. Materials with higher nutrient levels and BOD also have a greater potential to impact water quality if they escape to waterways.

The longer organic materials are stored, the greater the potential for the nutrient content, total solids, and salt content or pH to change. With some materials, testing for these parameters before removal may be advisable to properly calculate land application rates.

Fats and Oils

Materials that contain significant amounts of fats and oil (e.g. meat processing wastes, grease trap wastes) can be highly odorous. Significant management is required to prevent unacceptable odor levels at storage sites. Remote site locations for open-air storage may be sufficient in some cases, but in many localities, enclosed handling using pumps, hoses and tanks may be necessary to control odors. Fats and oils also contribute to high BOD. These materials may also present handling challenges caused by clogging or gumming up of equipment.

Dust Potential

Dried residuals such as composts and wood ash may generate dust during dry windy conditions. The potential of a material to create dust should be kept in

mind during site selection and these materials must be managed to alleviate off-site nuisance conditions.

Combustibility

Immature composts, wood chips and yard waste, poultry litter, biosolids blends, or heat dried materials may be combustible and/or, under certain conditions, undergo self-heating and spontaneous combustion from the heat generated by microbial decomposition. Wetting of dry material or confined storage, which traps heat, may exacerbate these conditions. Management plans should be developed to prevent this occurrence and contingency plans should be in place to respond appropriately if self-heating occurs.

Consistency/Predictability of Product Over Time

Consistency of the product's characteristics over time and the volume or amount produced over the course of a year should be considered. Certain facilities may produce greater quantities of an organic residual at certain times of the year (e.g., yardwaste) or the product characteristics may change over the course of a year (e.g. vegetable wastes at a cannery change as different crops are harvested and processed). The variability of a material in terms of volume or product characteristics may require increased flexibility in management and closer coordination of the storage and land application components.

Regulatory Considerations

Federal and state regulations governing organic residuals vary with the type or origin of the material, so the applicable laws for any given material must be investigated (see Appendix F for a list of state agency contacts). The land application of certain organic residuals is regulated under 40 CFR 257 "Criteria for Classification of Solid Waste Disposal Facilities and Practices" under the Resource Conservation and Recovery Act. However, theses criteria do not apply to agricultural wastes, including manures and crop residues. The Federal Part 257 regulations do not address storage issues specifically, but this regulation does include provisions regarding general management of these materials. For instance, residuals management practices conducted in floodplains may not restrict the flow of the base flood, reduce temporary water storage capacity of the floodplain, or result in washout of solid waste, so as to pose a hazard to human life, wildlife, or land or water resources. Likewise, practices may not: impact threatened or endangered species or habitat; be either a direct discharge or a nonpoint source of pollutants; or contaminate underground drinking water sources. In addition, Part 257 requires control of on-site populations of disease vectors.

From state to state, the degree of regulation governing the handling, transportation, storage, and beneficial use of organic residual materials varies widely. Some states require permits for land application or storage of these materials, similar to those for biosolids. Other states do not have comprehensive regulations or permitting requirements for all, or some types of,

these materials. Therefore, it is important that residual managers investigate the regulations thoroughly prior to initiating a storage and land application program. In addition, if a constructed storage facility is proposed, local zoning and building permit requirements will need to be investigated.

References

Brandt, R. C. and K. S. Martin. 1994, The Food Processing Residual Management Manual Pennsylvania Department of Environmental Resources, Harrisburg, PA. Pub. No. 2500-BK-DER-1649.